

Matthew vonAllmen

Northwestern University
725 Cowper St, Unit 31
Palo Alto, CA 94301

(425) 281-8308
matthewvonallmen2026@u.northwestern.edu

Education

Northwestern University
Computer Science PhD

Expected May 2025

The Claremont Colleges

Joint Math/CS Major through Harvey Mudd College
Mathematical Economics Major through Pitzer College

May 2020

May 2020

Research Areas of Interest

Mechanism Design

Budget Pacing

Statistical Machine
Learning

Probability Theory and
Statistics

Research Experience

Fundamental Limits of Availability and Throughput: Applications to prophet inequalities & transaction fee mechanism design

2024

Paper with Aadityan Ganesh, Jason Hartline, and Atanu Sinha. Outgrowth of work to improve the allocation of compute resources at Adobe Research.

Surprisals, P-values, and posteriors: Testing the utility of summary statistics

2023-present

Research with Jessica Hullman on which of various summary statistics are most useful for decision problems.

Mechanism Design and Inequality

2021-present

Research with Professors Sam Taggart and Jamie Morgenstern to identify revenue and welfare optimal mechanisms with two payment methods, time and money, when agents have different values for each.

Untying Knots with Neural Networks

2019

Research with Professor David Bachman, a topologist at Pitzer College. Analyzing what kinds of knots can be reduced to the unknot via neural networks whose layers are restricted to varying dimensions.

Are Prediction Markets Bayesian?

2019

Senior seminar project analyzing the extent to which prediction markets update their beliefs as though they were Bayesian agents. Uses kernel methods to determine whether price data is consistent with this hypothesis.

Projects

N64 Trigonometry: The Folded Polynomial

2023

Invented superior polynomial approximations to sine, cosine, and arctangent for the VR4300 microprocessor with up to 90-fold improved accuracy, and implemented them in MIPS assembly. Currently used by the N64 modding community.

Clinic Project **2019**

Predicted the effects of reflective microspheres when applied to young Arctic ice using sophisticated climate modelling techniques. Worked with Ice911 Research and Climformatics to see if this is a viable form of geoengineering.

Hilbert Compression **Fall 2017**

Developed an original image compression algorithm that outperforms standard JPEG compression for a wide class of images. Uses adaptive Hilbert curves to improve the locality of the discrete cosine transform. Example can be found here:

<https://github.com/SilasLock/Hilbert-Compression/wiki/Compression-Algorithm>

Academic and Community Service

Northwestern University

Environment Working Group Organizer, Mechanism Design for Social Good **2021-2023**
Coordinates activities, speakers, and events for a group of researchers and students.

TA for COMP_SCI 213: Intro to Computer Systems, Computer Science Department **Fall-2022**

TA for COMP_SCI 496: AI and Experimental Narrative, Computer Science Department **Spring 2022**

Harvey Mudd College

Neural Networks Tutor, Computer Science Department **Fall 2018**
Provided guidance to students in a neural networks class, and worked with the professor to ensure they understood the material.

Pitzer College

Website Developer, Pitzer Outdoor Adventures **2016-2018**
Developed a web service to help students coordinate hikes and long-distance trips. Used SQLAlchemy to protect users' data and to streamline the hiking gear check-out process. Collaborated with team via GitHub.

GM & Lore Writer, 5C RPG Association **2017-present**
Wrote over 200 pages of lore and game materials for an original setting, modelled after events in Islamic history. Runs biweekly sessions for other members of the association.

Staff Reporter, Pitzer Peel **Fall 2016**
Wrote weekly articles for Pitzer College's campus newspaper. Focused on current events, global politics, and the history of mathematics.

Work Experience

Okta

Software Intern, NXT Team **Summer 2019**
Reworked the process of changing one's password in the company's web application, so that user inputs are immediately evaluated with each key press. Performed both front end and back end work.

Skills

Programming Languages

- Strongly proficient in Julia, C#, and Python, proficient with Numba
- Experienced in website development, very proficient in CSS and JavaScript
- Familiar with Rust, C++, Java

Statistical & Machine-learning Software

- Familiar with Keras, PyTorch, and Stata

References

Dr. Jason Hartline
Professor of Computer Science, Northwestern
University
Address: 2233 Tech Drive, Computer Science
McCormick School of Engineering, Northwestern
University, Evanston, IL 60208
Tel: (847) 467-0280
Email: hartline@northwestern.edu

Atanu Sinha
Principal Scientist, Adobe Research
Email: atr@adobe.com